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Chen

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(54) **COVERING OF BUILDING'S OPENING**

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(51) **Int. Cl.**

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E06B 3/26	(2006.01)
E06B 3/30	(2006.01)
E06B 9/06	(2006.01)
E06B 3/48	(2006.01)

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CPC ***E06B 5/003*** (2013.01); ***E06B 3/2605*** (2013.01); ***E06B 3/30*** (2013.01); ***E06B 3/48*** (2013.01); ***E06B 9/06*** (2013.01)

(58) **Field of Classification Search**
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USPC 160/87, 88, 89, 90, 91, 114, 113, 183, 160/199, 206
See application file for complete search history.

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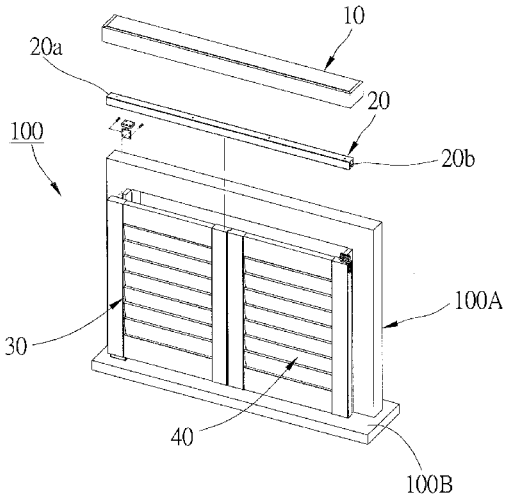
(57) **ABSTRACT**

A covering of a building opening includes a rail, a first sash, and a second sash. The rail has a first end and a second end at opposite ends, wherein the rail is straight from the first end to the second end. The first sash is connected to a first axle, wherein the first axle is adjacent to the first end of the rail. The second sash is hinged with the first sash, and connected to a second axle, wherein the second axle is engaged with the rail to reciprocate along the rail. The first axle is not on a moving path of the second axle, nor an extending line of the moving path of the second axle. The covering further includes an adjustable assembly for adjusting a vertical position and a horizontal position of the first sash.

14 Claims, 11 Drawing Sheets



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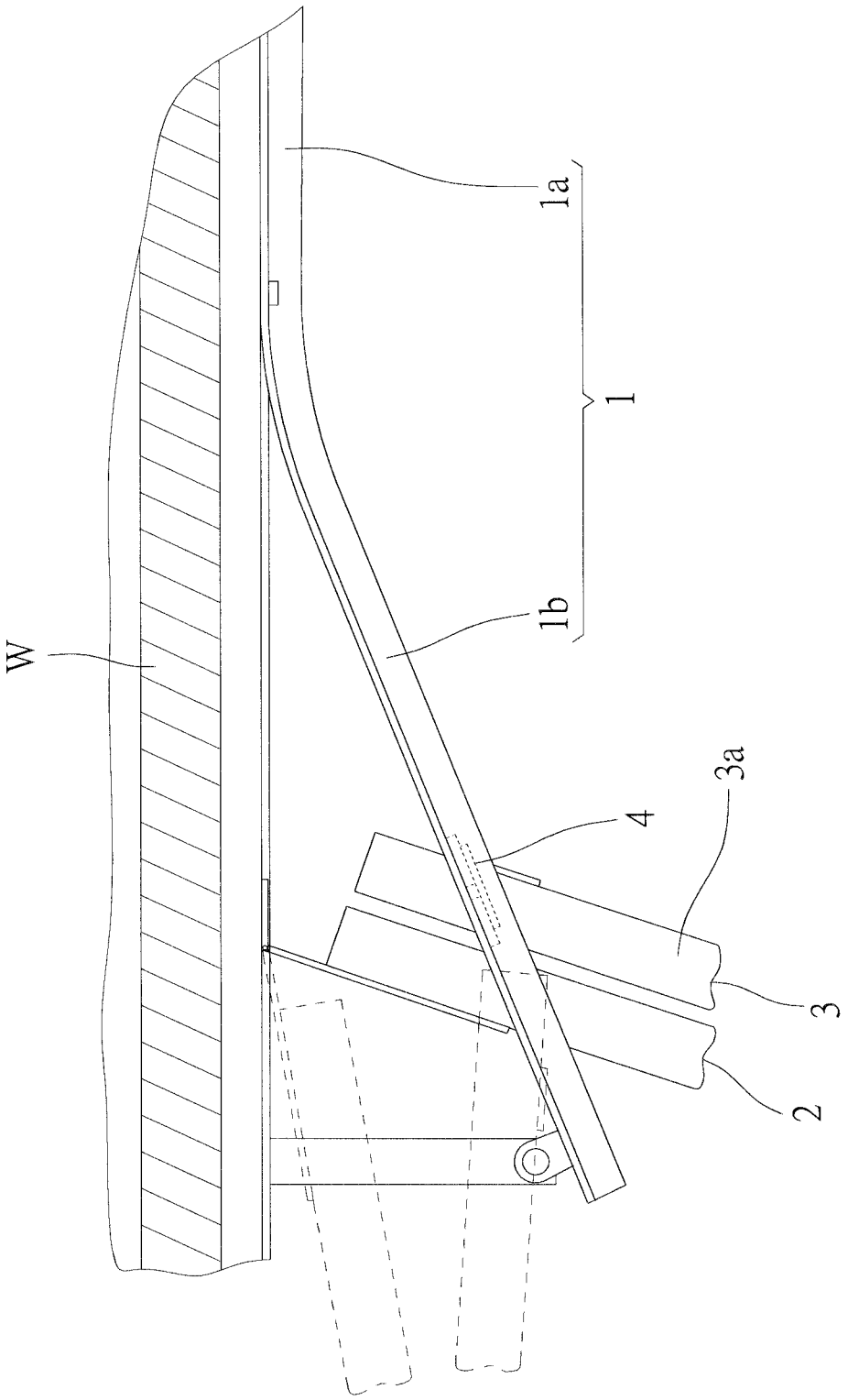

FIG. 1
(PRIOR ART)

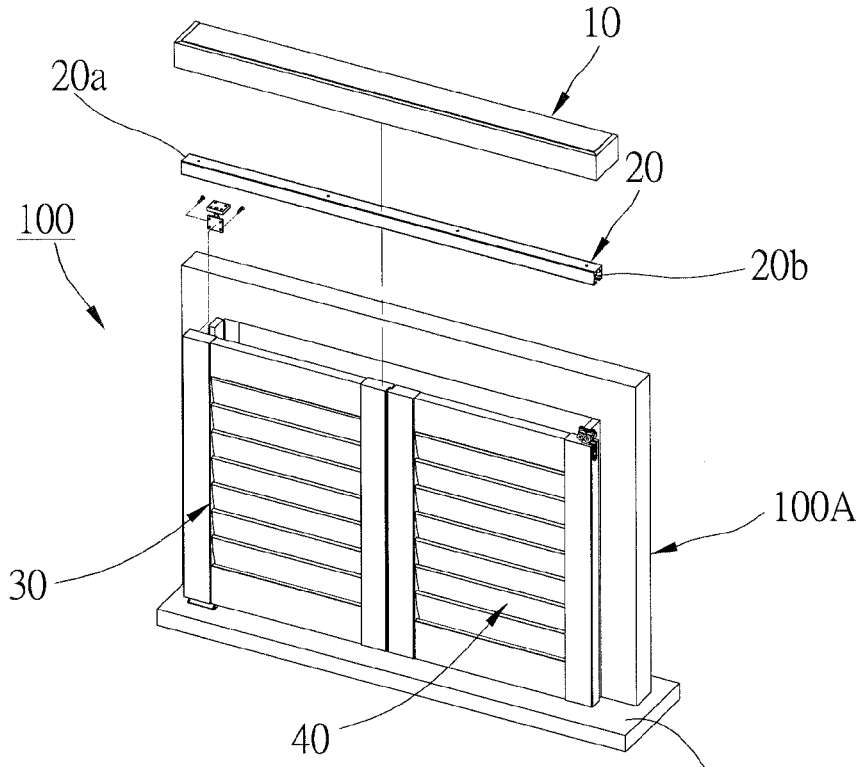

FIG. 2

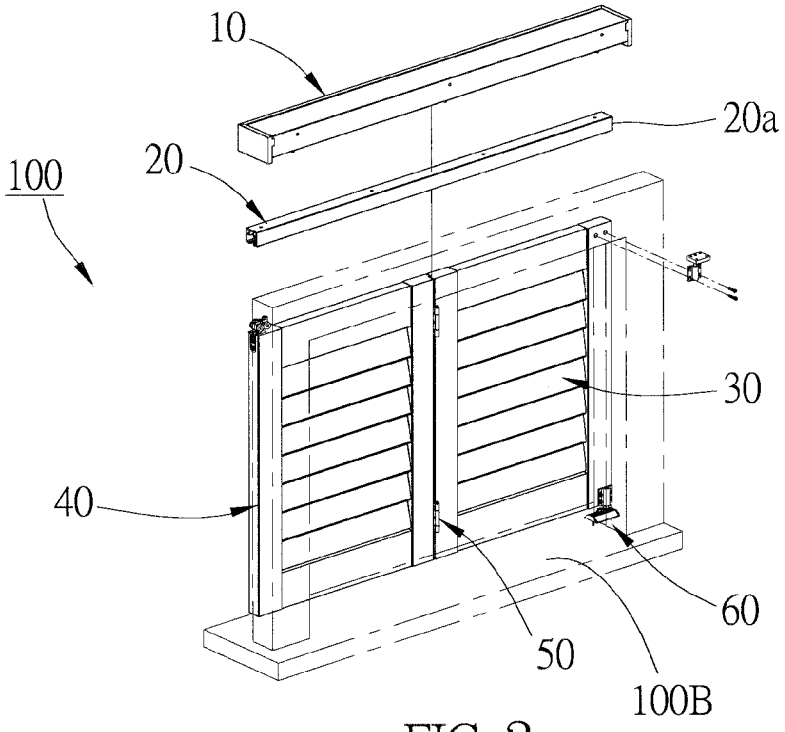

FIG. 3

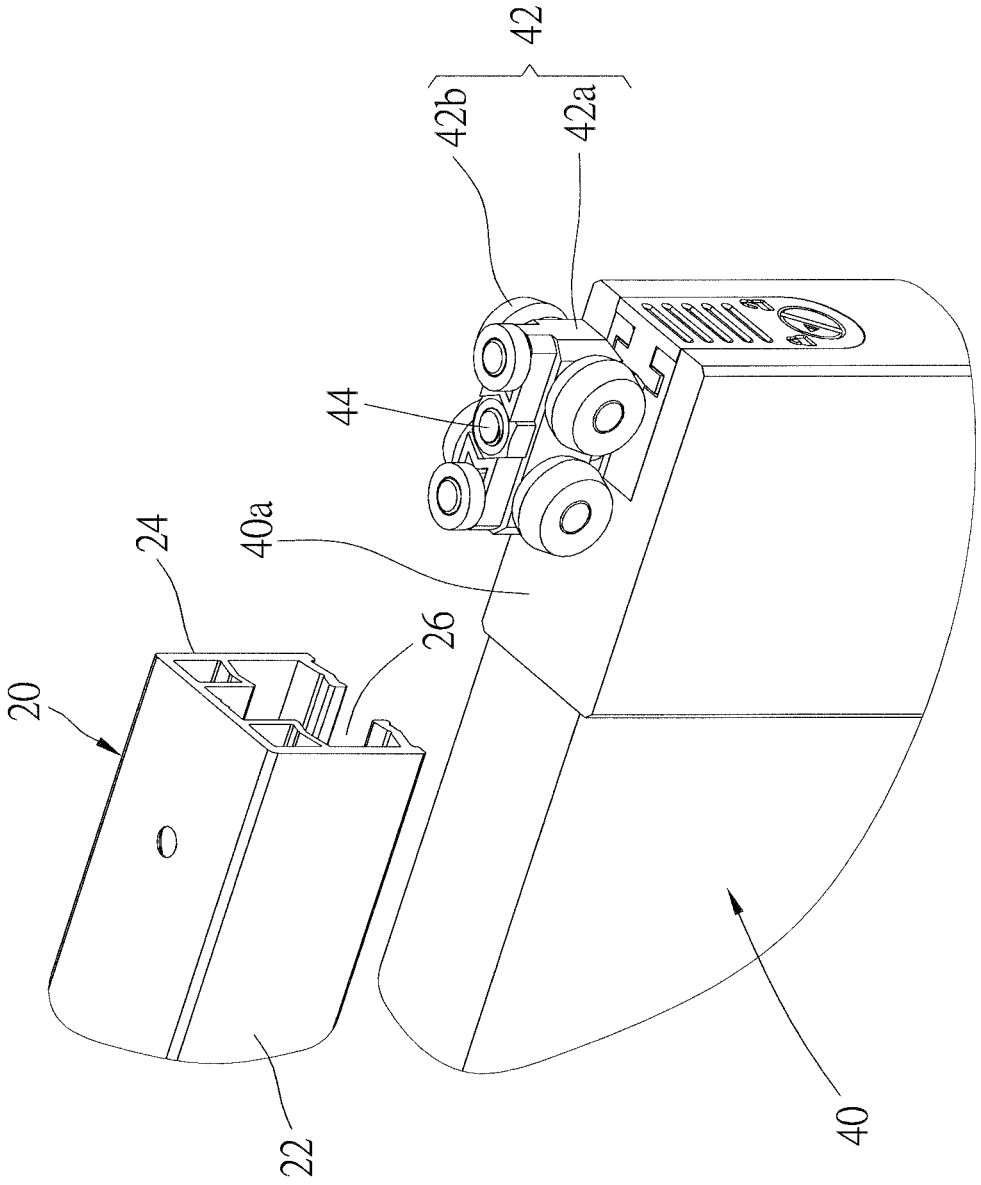

FIG. 4

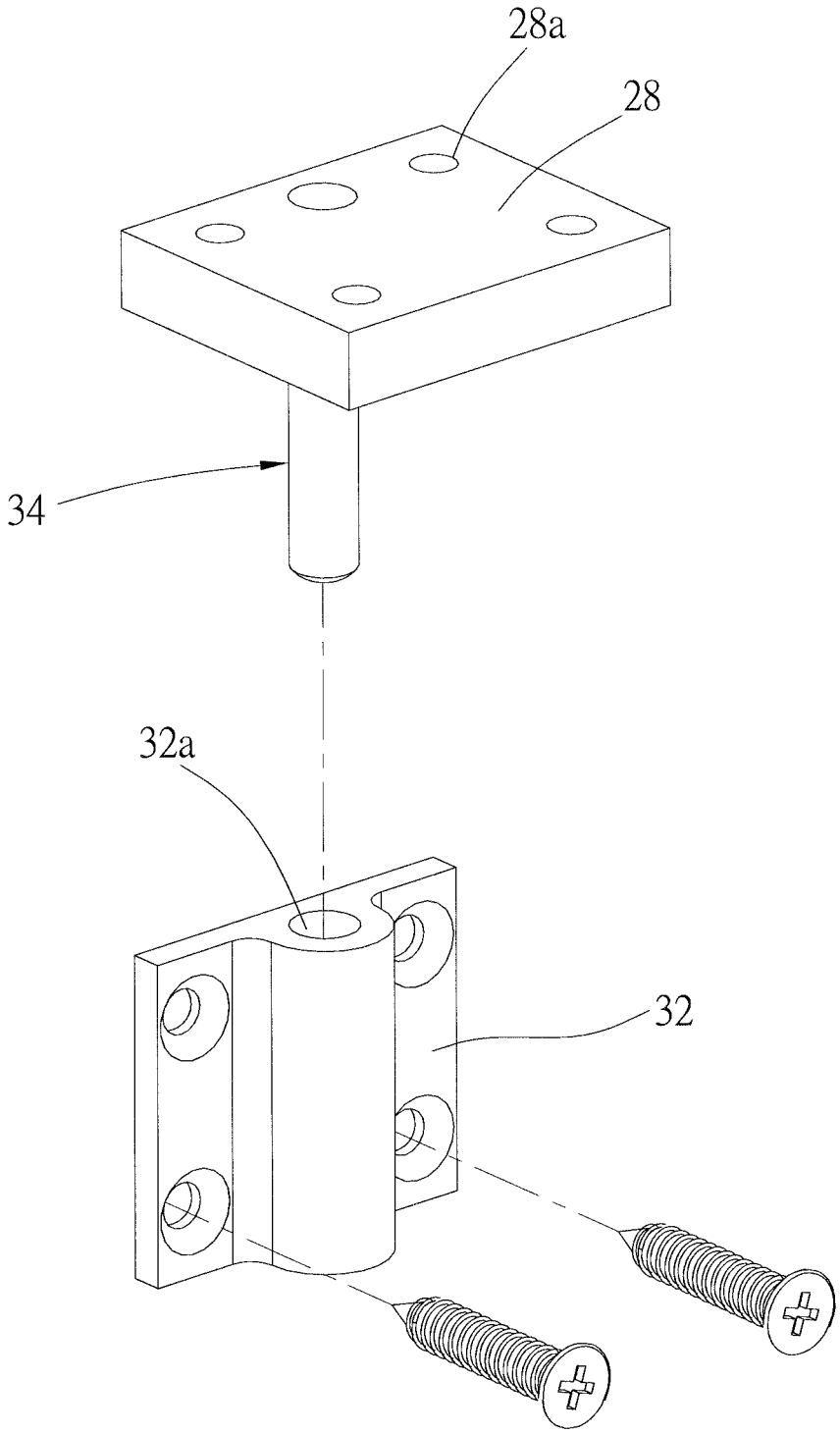

FIG. 5

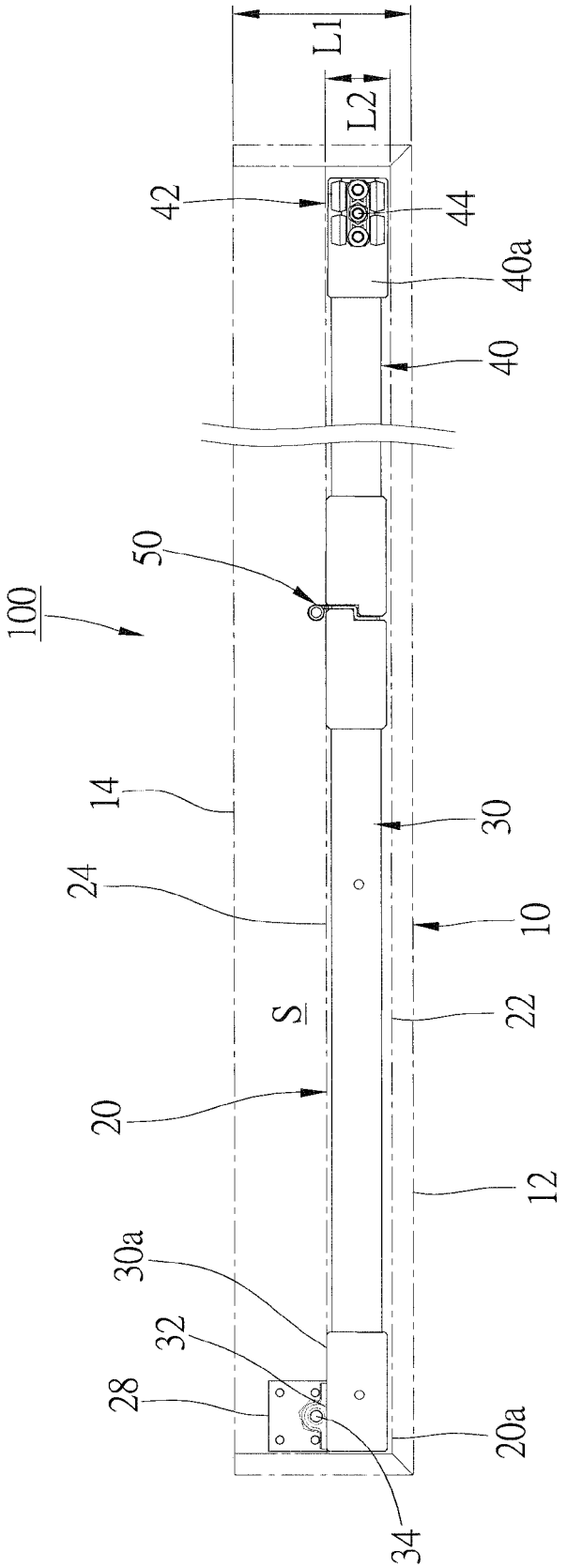

FIG. 6

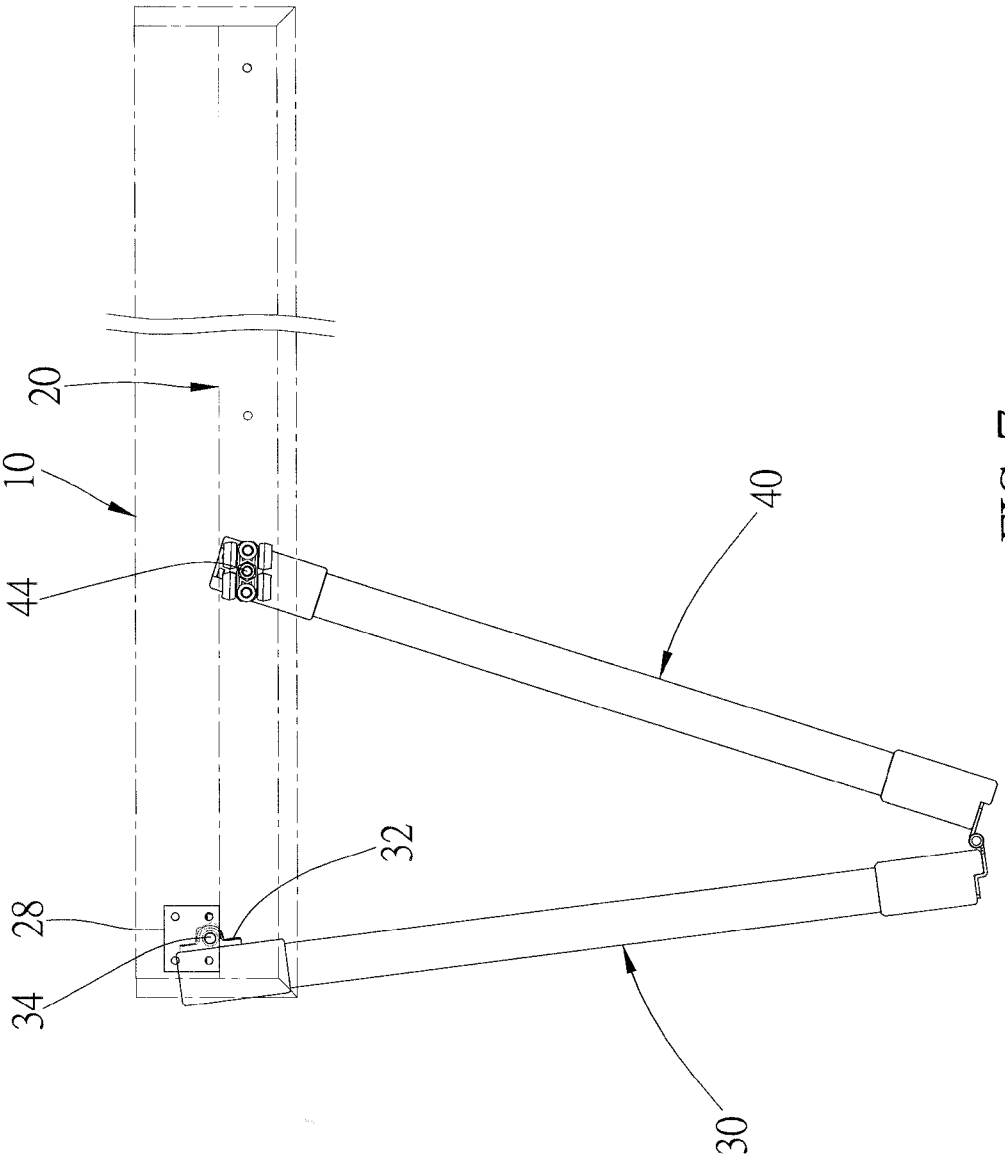

FIG. 7

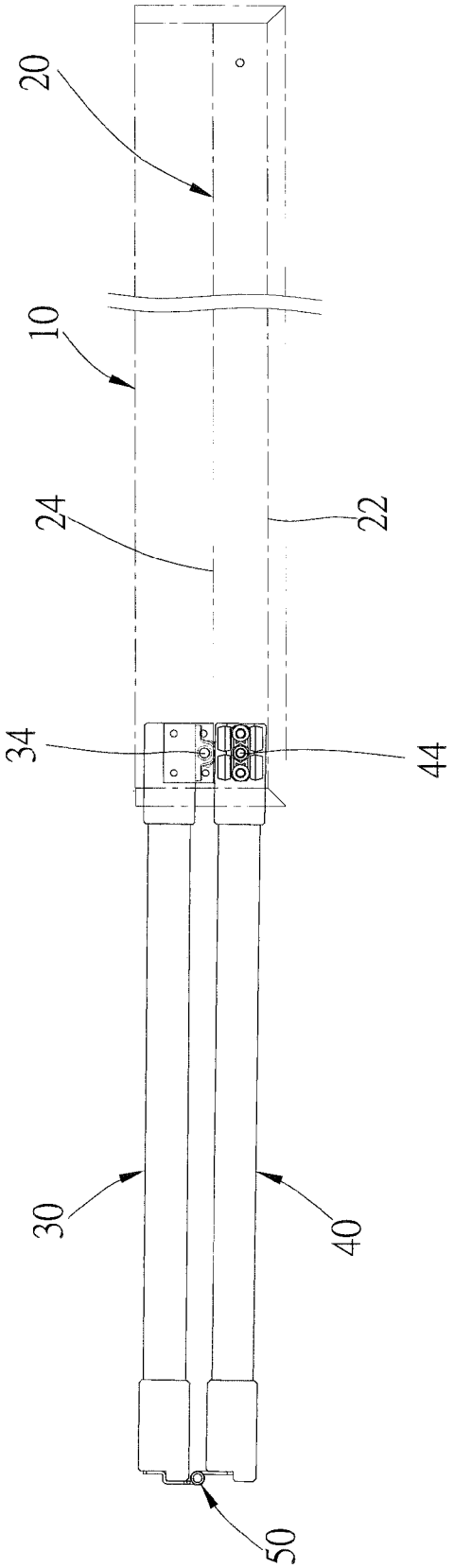

FIG. 8

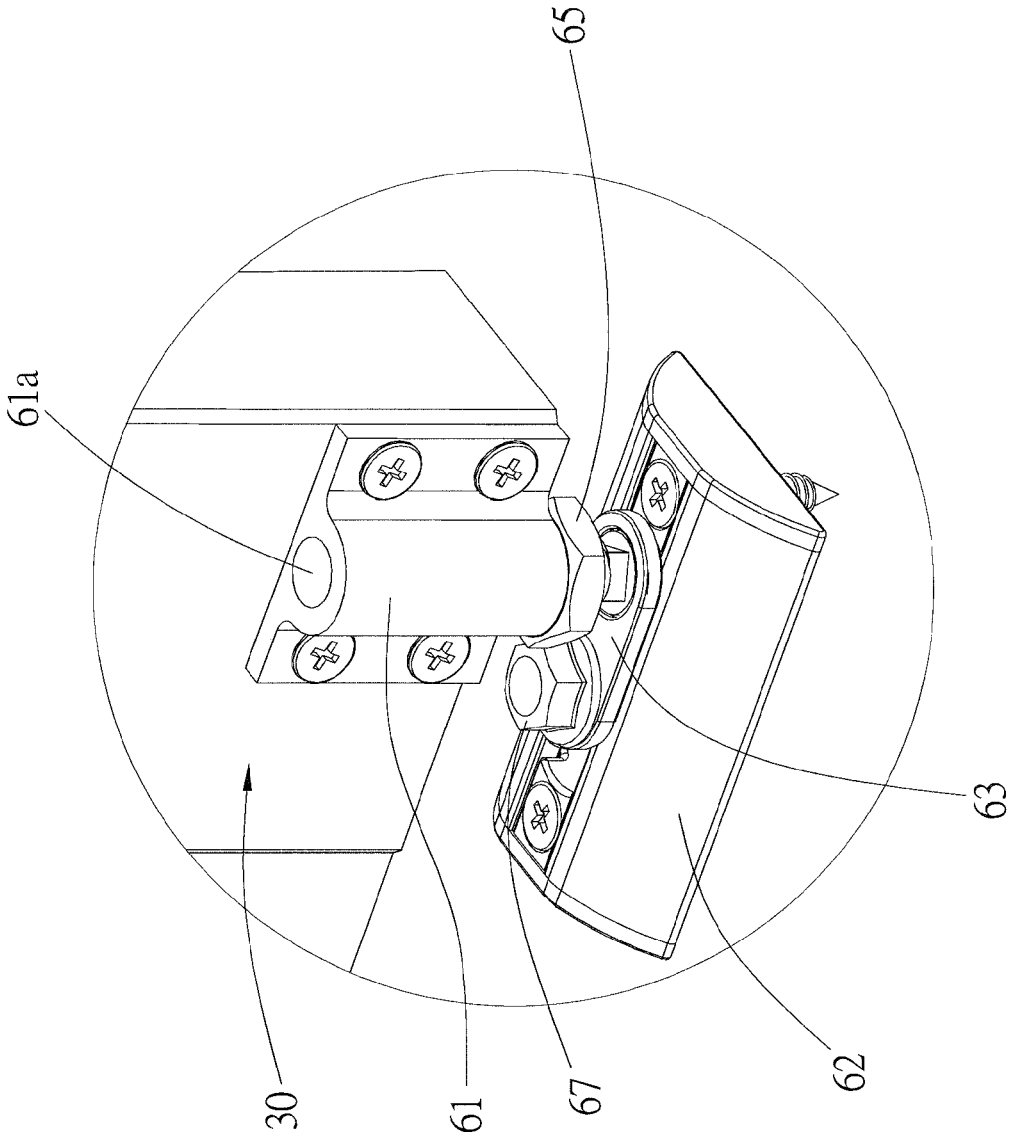

FIG. 9

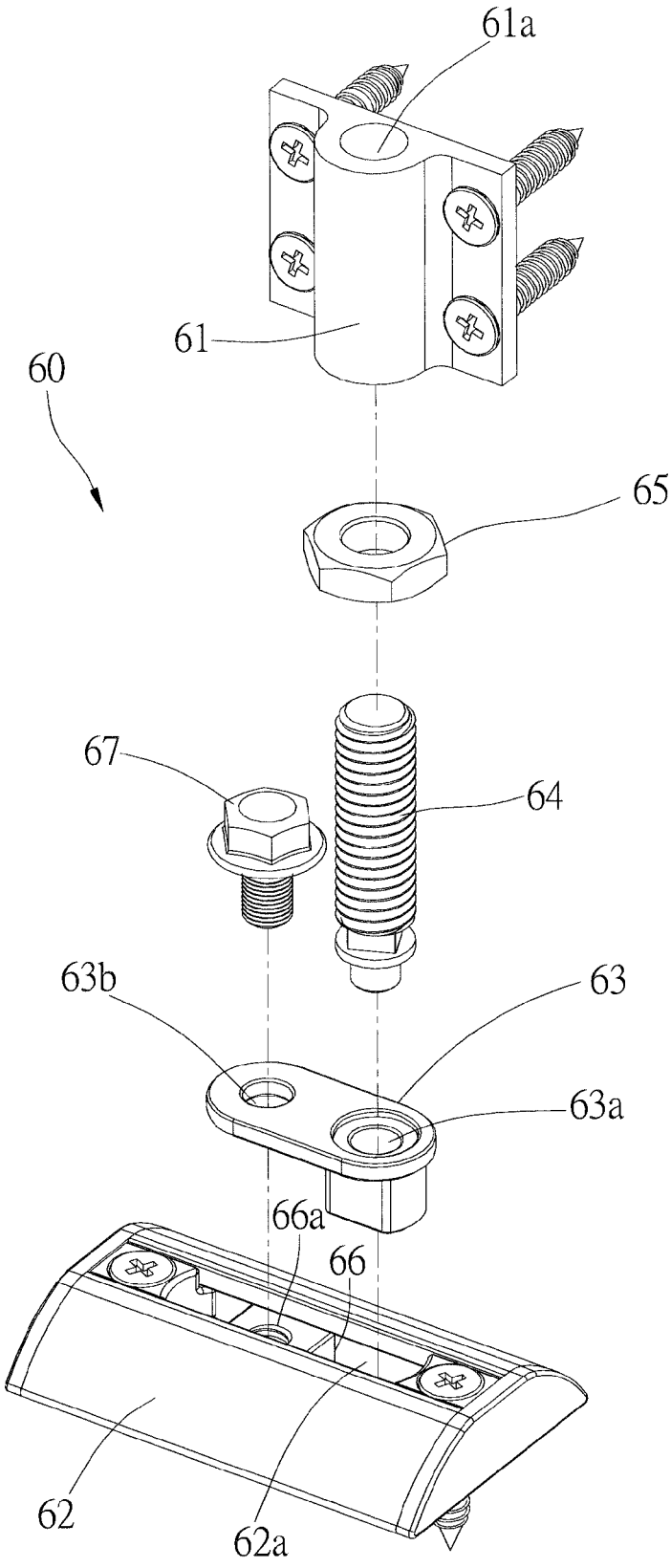

FIG.10

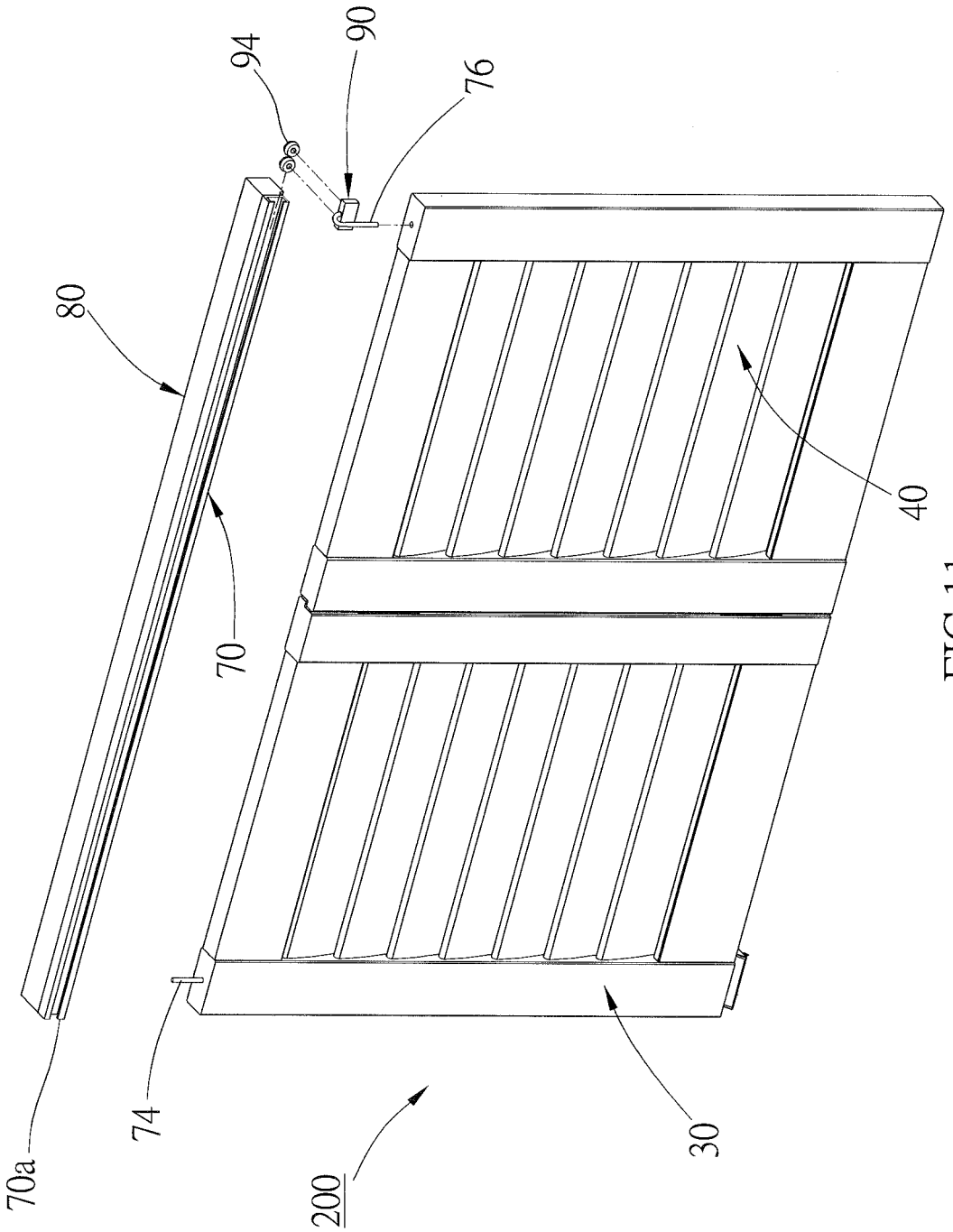

FIG.11

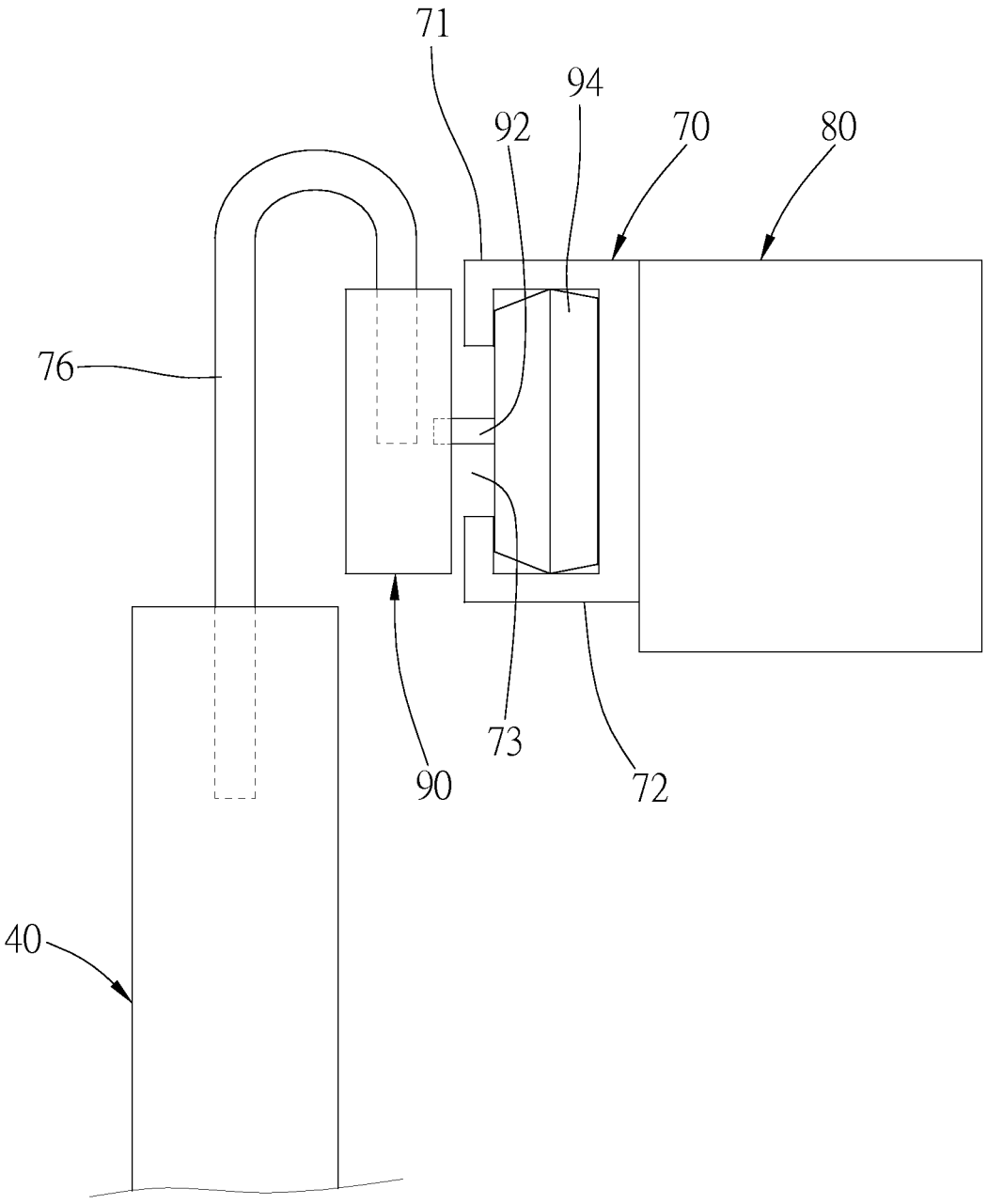

FIG.12

COVERING OF BUILDING'S OPENING

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to a door or window, and more particularly to a covering of a building's opening.

2. Description of the Related Art

A covering for an opening of a building, such as window or door, has various types. Take a window for example, the common type of the window has two sliding or hinged sashes. In this type of window, the sashes take some space of the window opening. It is bad for ventilation. Another window is similar to a casement window, having two hinged sashes, one of which is pivoted on the frame, and the other one of which is slidably engaged with a rail. Slide the sash will fold the sashes. In this window covering, the rail is straight, and the sash can't be moved when the folded sashes fold up. Therefore, people may hit the sashes when he/she walks by U.S. Pat. No. 1,570,958 disclosed a conventional door having a warp rail **1** as shown in FIG. **1**. The rail **1** includes a straight section **1***a* and a curved section **1***b*. A first sash **2** is pivoted on a wall W, and a second sash **3** is hinged with the first sash **2**. The second sash **3** is provided with a pulley assembly **4** to engage the rail **1**. Just like the casement window, the second sash **3** is moved toward the first sash **2** to open the door. The sashes **2**, **3** are folded, and moved off the opening because of the curved section **1***b*. It is easy to understand that the warp rail is expensive and difficult to manufacture. Furthermore, the warp rail makes the sashes move in a strange way. It is not good looking. In addition, while the sashes **2**, **3** are opened, although they still are attached to the wall W (shown as the dot lines in the drawing), they are not tightly folded together.

SUMMARY OF THE INVENTION

The primary objective of the present invention is to provide a covering of a building's opening, which provides the sashes to be folded and attached to the wall with a straight rail when one opens the covering.

According to the objective of the present invention, a covering of a building opening includes a rail, a first sash, and a second sash. The rail has a first end and a second end at opposite ends, wherein the rail is straight from the first end to the second end. The first sash is connected to a first axle, wherein the first axle is adjacent to the first end of the rail. The second sash is hinged with the first sash, and connected to a second axle, wherein the second axle is engaged with the rail to reciprocate along the rail. The first axle is not on a moving path of the second axle, nor an extending line of the moving path of the second axle.

In an embodiment, the rail has a front side at a front, a rear side at a rear, and a rail opening at a bottom; the first axle is by the rear side of the rail and near the first end; the second axle has opposite ends engaged with the rail via the rail opening and connected to the second sash respectively.

In an embodiment, the covering further includes a rail base and a pivoting base, wherein the rail is fixed to a bottom of the rail base, and the pivoting base is fixed to the rear of the first sash; the first axle is vertical which has an end connected to the rail base and an opposite end pivoted on the pivoting base.

In an embodiment, the rail base comprises a case, and the case has a front side and a rear side; the rail is received in the rail base between the front side and the rear side; a distance between the front side and the rear side of the rail base is greater than a distance between the front side and the rear side of the rail.

In an embodiment, the covering further includes a pulley assembly engaged with the rail to reciprocate along the rail, wherein the opposite ends of the second axle are connected to the pulley assembly and a top of the second sash respectively.

In an embodiment, the rail has a top side at a top, a bottom side at a bottom, and a rail opening at a front; the first axle is under the bottom side of the rail and near the first end; the second axle has opposite ends engaged with the rail via the rail opening and connected to the second sash respectively.

In an embodiment, the covering further includes a pulley base and a pulley connected to the pulley base for rotation, wherein the pulley is engaged with the rail, and the pulley base is left out of the rail; the opposite ends of the second axle are connected to the pulley base and the second sash respectively.

In an embodiment, the second axle is a U-shaped bar having the opposite ends connected to a top of the pulley base and a top of the second sash respectively.

In an embodiment, the covering further includes an adjustable assembly under the first sash for change a vertical position of the first sash.

In an embodiment, the adjustable assembly includes a lateral member, a base member, and a thread rod; the lateral member is fixed to the first sash and has a threaded axial bore; the thread rod has an end screwed into the axial bore of the lateral member and an opposite end connected to the base member, whereby the vertical position of the first sash is changed by turning the thread rod.

In an embodiment, the base member has a cavity and a hole at a bottom of the cavity, and the thread rod has a rim and a protrusion on the rim; the protrusion is received in the hole, and the rim is received in the cavity, whereby the threaded rod turns freely related to the base member.

In an embodiment, the covering further includes an adjustable assembly under the first sash for change a horizontal position of the first sash.

In an embodiment, the adjustable assembly includes a lateral member, a base member, a rod, and a movable plate; the lateral member is fixed to the first sash; the base member has an elongated slot, and the movable plate is engaged with the slot to move along the slot; the rod has opposite end connected to the movable plate and the lateral member, whereby the horizontal position of the first sash is by moving the movable plate.

In an embodiment, the adjustable assembly further includes a movable block received in the slot of the base member and a bolt; the movable block has a threaded hole, and the movable plate has a through hole; the bolt passes through the through hole of the movable plate, and is screwed into the threaded hole of the movable block to fix the movable plate to the base member by tightening the bolt.

Therefore, the hanger of the present invention may be incorporated in a straight rail, and make the sashes totally move off the window opening.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a sketch diagram of the conventional door;

FIG. **2** is an exploded view of a first preferred embodiment of the present invention, showing the first and the second sashes in the extended condition;

FIG. **3** is another exploded view of the first preferred embodiment of the present invention;

FIG. **4** is a perspective view of the first preferred embodiment of the present invention, showing the pulley and the rail in the extended condition;

FIG. **5** is an exploded view of the first preferred embodiment of the present invention, showing the fixed board, the first axle, and the pivoting base;

FIG. **6** is a top view of the first preferred embodiment of the present invention, showing the first and the second sashes in the extended condition;

FIG. **7** is a top view of the first preferred embodiment of the present invention, showing the second sash moved toward the first sash;

FIG. **8** is a top view of the first preferred embodiment of the present invention, showing the first and the second sashes folded and attached to the wall;

FIG. **9** is a perspective view of the adjustable assembly of the first preferred embodiment of the present invention;

FIG. **10** is an exploded view of the adjustable assembly of the first preferred embodiment of the present invention;

FIG. **11** is an exploded view of a second preferred embodiment of the present invention; and

FIG. **12** is a sketch diagram of the second preferred embodiment of the present invention, showing the first and the second sashes and the rail.

DETAILED DESCRIPTION OF THE INVENTION

The detailed description and technical contents of the present invention will be explained with reference to the accompanying drawings. However, the drawings are illustrative only but not used to limit the present invention.

FIGS. from FIG. **2** to FIG. **5** show a covering of an opening of a building, and it is shown as a window in the figures. The covering **100** includes a rail base, a straight rail **20**, a first sash **30**, and a second sash **40**.

We take a case **10** for example to describe the rail base of the covering **100**. The case **10** is a hollow rectangular bar with a bottom opening at a bottom thereof. The case **10** is mounted on a window frame **100**A, or it may be mounted on a sidewall the opening of the building directly. The case **10** has a front side **12** at a front and a rear side **14** at a rear (FIG. **6**), which are vertical planes and parallel to an elongated axis of the case **10**. A distance between the front side **12** and the rear side **14** (so called a width of the case **10**) is defined as a first distance L**1**. The rail **20** is received in the case **10** and fixed therein, therefore the rail **20** is fixed to the window frame **100**A (or the wall) through the case **10**. The case **10** provides a space between the wall and the sashes **30**, **40** for the sashes **30**, **40** to turn and move.

The rail **20** is exposed via the bottom opening of the case **10**. The rail **20** is an elongated hollow member with a rail opening **26** at a bottom thereof. The rail **20** has a first end **20***a* and a second end **20***b* at opposite ends, and the rail **20** is straight from the first end **20***a* to the second end **20***b*. The rail **20** further has a front side **22** and a rear side **24**, which are vertical planes and parallel to an elongated axis of the rail **20**. A distance between the front side **22** and the rear side **24** (so called a width of the rail **20**) is defined as a second distance L**2**, and the second distance L**2** is shorter than the first distance L**1**. The rail **20** is closer to the front side **12** of the case **10** than the rear side **14**, so that a space S is left between the rear side **24** of the rail **20** and the rear side **14** of the case **10**.

The first and the second sashes **20**, **40** are hinged with each other by two hinges **50**, so that they may be moved between an extended condition and a folded condition. A pivoting base **32** is fixed to a rear side **30***a* of the first sash **30** and adjacent to a top of the first sash **30**. The pivoting base **32** has a vertical bore **32***a*. A first axle **34** has an end fixed to a bottom of a fixed board **28**. The fixed board **28** has a plurality of openings **28***a* for bolts (not shown) to fix the fixed board **28** to an interior side of a top of the case **10**, therefore the fixed board **28** and the first axle **34** are received in the space S of the case **10**. The fixed board **28** is closer to the first end **20***a* of the rail **20** than the second end **20***b*. The first axle **34** is inserted into the bore **32***a* of the pivoting base **32**, so that the pivoting base **32** is under in the space S, and the first sash **30** is under the rail **20**. The first axle **34** is a center of rotation of the first sash **30**. In an embodiment, the fixed board **28** is fixed to the rear side **24** of the rail **20** rather than the case **10**. In another embodiment, the first axle **34** is pivoted on the rear side **24** of the rail **20** without the pivoting base **32**.

The second sash **40** is provided with a pulley assembly **42** at a top **40***a* thereof. The pulley assembly **42** includes a base member **42***a* and pulleys **42***b* connected to the base member **42***a* for free rotation. The base member **42***a* is received in the rail **20**, and the pulleys **42***b* engage the rail **20** to let the pulley assembly **42** reciprocates along the rail **20**. A second axle **44** has an end fixed to the base member **42***a* of the pulley assembly **42** and the other end connected to the top **40***a* of the second sash **40** to pivot the pulley assembly **42** on the top **40***a* of the second sash **40**. The second axle **44** moves along the rail **20** between the first end **20***a* and the second end **20***b*.

FIG. **6** shows the first and the second sashes **30**, **40** in the extended condition in which the second sash **40** is moved to the second end **20***b* of the rail, and both the sashes **30**, **40** close the opening. In the extended condition the first axle **34** is adjacent to the first end **20***a* of the rail **20**, and the second axle **44** is adjacent to the second end **20***b*. Furthermore, the first axle **34** is under the space S (behind the rear side **24** of the rail **20**), and the second axle **44** is under the rail **20**. In other words, the first axle **34** is not on a moving path of the second axle **44**.

FIG. **7** shows the second sash **40** being moved toward the first end **20***a* of the rail **20**. During the movement, the second sash **40** moves and turns, and the first sash **30** turns, and then the first sash **30** and the second sash **40** will be folded. Keep moving the folded sashes **30**, **40** will turn them for 180 degrees and attach them to a wall by the opening. During this movement, the first sash **30** and the second sash **40** will be kept in a folded condition.

The entire rail **20** used in the covering **100** is straight, so that the present invention would not have the drawbacks of the prior arts. When the covering **100** is opened, the sashes **30**, **40** are folded and attached to the wall by the opening that may reduce the space for the covering **100**.

As shown in FIGS. **3**, **9**, and **10**, an adjustable assembly **60** is provided under the first sash **30**. The adjustable assembly **60** includes a lateral member **61**, a base member **62**, a movable plate **63**, a threaded rod **64**, a nut **65**, movable block **66**, and a bolt **67**. The lateral member **61** is fixed to a lateral side of the first sash **30**, and has an axial bore **61***a*. The base member **62** is fixed to a bottom board **100**B of the window frame **100**A, and has an elongated slot **62***a*. The movable plate **63** engages the slot **62***a* of the base member **62** to move along the slot **62***a*. The movable plate **63** has an opening **63***a* and a through hole **63***b*. An end of the threaded rod **64** is screwed into the nut **65**, and then is screwed into the axial bore **61***a* (the axial bore **61***a* is threaded) to rest the nut **65** on a bottom of the lateral member **61**. The other end of the threaded rod **64** is inserted into the opening **63***a* of the movable plate **63**. The opening **63***a* has a cavity at a top and a hole at a bottom of the cavity, and the thread rod **64** has a rim at the end and a protrusion on the rim. The protrusion is received in the hole, and the rim is received in the cavity, so that the threaded rod **64** is able to turn freely related to the base member **62**.

Therefore, a vertical position of the first sash **30** is adjustable by turning the nut **65** and the threaded rod **64** respectively. The adjustment of the vertical position of the first sash **30** could even the first sash **30** and the second sash **40** to make the movement of the sashes **30**, **40** smoothly.

While the adjustable assembly only provides user to adjust the vertical position of the sash, it may provide opening **63***a* on the base member directly. In other words, the adjustable assembly adjusts the vertical position of the sash without the movable plate **63**.

The movable block **66** is movably received in the slot **62***a*, and has a threaded hole **66***a*. The bolt **67** passes through the through hole **63***b* of the movable plate **63**, and is screwed into the threaded hole **66***a* of the movable block **66**. The movable block **66** will be secured in the slot **62***a* by tightening the bolt **67**. In other words, the position of the threaded rod **64** along the slot **62***a* is adjustable by moving the movable block **66** to a desired position, and then tightening the bolt **67**. As a result, a horizontal position of the first sash **30** is adjustable, which may make the movement of the sashes **30**, **40** smoothly. At the same time, the first axle **34** is fixed to the fixed board **28** on the bottom of the case **10**, and the openings **28***a* on the fixed board **28** could be elongated, which facilitates the movable plate **63** to move in the slot **62***a*.

FIG. **11** and FIG. **12** show a covering **200** of the second preferred embodiment of the present invention, which is basically the same to the first preferred embodiment, except that a rail **70** is fixed to a front side of a beam **80** instead of the case **10**. The case **10**, the beam **80**, and their equivalent devices could be called rail base. The rail **70** has a top side **71** and a bottom side **72**, and has an elongated rail opening **73** at a front thereof, which is between and parallel to the top side **71** and the bottom side **72**. A first axle **74** is connected to a top of the first sash **30**, and a second axle **76** is connected to the second sash **40**. The first axle **74** is adjacent to a first end **70***a* of the rail **70** and under the bottom side **72** of the rail **70**. The second axle **76** has an end inserted into a pulley base **90** for free rotation. Two pulleys **94** are connected to the pulley base **90** through two axles **92**. The pulleys **94** are received in the rail **70** to move along the rail **70**, and the pulley base **90** is left out of the rail **70** via the rail opening **73**. The second axle **76** is a U-shaped (hook-shaped?) bar having opposite ends inserted into bores on the tops of the second sash **40** and the pulley base **90**. The second axle **76** is fixedly connected to the second sash **40**, and pivotally connected to the pulley base **90**. As a result, the second sash **40** is able to turn and reciprocate along the rail **70**.

The movement and function of the first and the second sashes **30**, **40** are the same as the first preferred embodiment. The same as above, the first axle **74** is not on a moving path of the second axle **76**, so that the sashes **30**, **40** may be totally moved off the opening and attached to the wall by the opening.

The description above is only a few preferred embodiments of the present invention and the equivalence of the present invention is still in the scope of claim construction of the present invention.

What is claimed is:

1. A covering of a building opening, comprising:

a rail having a first end and a second end at opposite ends, wherein the rail is straight from the first end to the second end;

a first sash connected to a first axle, wherein the first axle is adjacent to the first end of the rail;

a second sash hinged with the first sash, and connected to a second axle, wherein the second axle is engaged with the rail to reciprocate along the rail;

wherein the first axle is not on a moving path of the second axle, nor an extending line of the moving path of the second axle;

wherein the rail has a front side at a front and a rear side at a rear;

wherein the rail is in front of the first axle;

wherein the first sash and the second sash can be folded together by moving the second axle in the rail, and the folded first and second sashes are rotatable toward the front side of the rail;

wherein when the first sash and the second sash are folded together, the first sash crosses the rail; and

wherein when the first sash and the second sash are together rotated to be parallel to an extension direction of the rail, the second sash is just in the extension direction of the rail.

2. The covering as defined in claim **1**, wherein the rail has a rail opening at a bottom; the first axle is by the rear side of the rail and near the first end; the second axle has opposite ends engaged with the rail via the rail opening and connected to the second sash respectively.

3. The covering as defined in claim **2**, further comprising a wheel assembly engaged with the rail to reciprocate along the rail, wherein the opposite ends of the second axle are connected to the wheel assembly and a top of the second sash respectively.

4. The covering as defined in claim **2**, further comprising a rail base and a pivoting base, wherein the rail is fixed to a bottom of the rail base, and the pivoting base is fixed to the rear of the first sash; the first axle is vertical which has an end connected to the rail base and an opposite end pivoted on the pivoting base.

5. The covering as defined in claim **4**, wherein the rail base comprises a case, and the case has a front side and a rear side; the rail is received in the rail base between the front side and the rear side; a distance between the front side and the rear side of the rail base is greater than a distance between the front side and the rear side of the rail.

6. The covering as defined in claim **1**, wherein the rail has a top side at a top, a bottom side at a bottom, and a rail opening at a front; the first axle is under the bottom side of the rail and near the first end; the second axle has opposite ends engaged with the rail via the rail opening and connected to the second sash respectively.

7. The covering as defined in claim **6**, further comprising a wheel base and a wheel connected to the wheel base for rotation, wherein the wheel is engaged with the rail, and the wheel base is left out of the rail; the opposite ends of the second axle are connected to the wheel base and the second sash respectively.

8. The covering as defined in claim **7**, wherein the second axle is a U-shaped bar having the opposite ends connected to a top of the wheel base and a top the second sash respectively.

9. The covering as defined in claim **1**, further comprising an adjustable assembly under the first sash for changing a vertical position of the first sash.

10. The covering as defined in claim **9**, wherein the adjustable assembly includes a lateral member, a base member, and a thread rod; the lateral member is fixed to the first sash and has a threaded axial bore; the thread rod has an end screwed into the axial bore of the lateral member and an opposite end connected to the base member, whereby the vertical position of the first sash is changed by turning the thread rod.

11. The covering as defined in claim **10**, wherein the base member has a cavity and a hole at a bottom of the cavity, and the thread rod has a rim and a protrusion on the rim; the

protrusion is received in the hole, and the rim is received in the cavity, whereby the threaded rod turns freely related to the base member.

12. The covering as defined in claim **1**, further comprising an adjustable assembly under the first sash for change a horizontal position of the first sash.

13. The covering as defined in claim **12**, wherein the adjustable assembly includes a lateral member, a base member, a rod, and a movable plate; the lateral member is fixed to the first sash; the base member has an elongated slot, and the movable plate is engaged with the slot to move along the slot; the rod has opposite end connected to the movable plate and the lateral member, whereby the horizontal position of the first sash is adjusted by moving the movable plate.

14. The covering as defined in claim **13**, wherein the adjustable assembly further includes a movable block received in the slot of the base member and a bolt; the movable block has a threaded hole, and the movable plate has a through hole; the bolt passes through the through hole of the movable plate, and is screwed into the threaded hole of the movable block to fix the movable plate to the base member by tightening the bolt.

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